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Remarks

Claims 1-23 are pending in the application.

Claims 1, 2, 4, 9-11, 14 and 16-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Chou et al. ("Chou") (U.S. Patent Application Publication No. 2005/0280886).

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou in view of Farries et al. ("Farries") (U.S. Patent No. 5,127,928).

Claims 1, 2, 4, 8, 15, 17-19, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. ("Takeda") (U.S. Patent Application Publication No. 2004/0100681) in view of Bjarklev et al. ("Bjarklev") (U.S. Patent Application No. 2004/0100681) and further in view of Cearn's et al. ("Cearn's") (U.S. Patent No. 5,943,149).

Claims 3, 5-7, 12 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Each of the various rejections and objections are overcome by amendments that are made to the specification, drawing, and/or claims, as well as, or in the alternative, by various arguments that are presented.

Any amendments to any claim for reasons other than as expressly recited herein as being for the purpose of distinguishing such claim from known prior art are not being made with an intent to change in any way the literal scope of such claims or the range of equivalents for such claims. They are being made simply to present language that is better in conformance with the form requirements of Title 35 of the United States Code or is simply clearer and easier to understand than the originally presented language. Any amendments to any claim expressly made in order to distinguish such claim from known prior art are being made only with an intent to change the literal scope of such claim in the most minimal way, i.e., to just avoid the prior art in a way that leaves the claim novel and not obvious in view of the cited prior art, and no equivalent of any subject matter remaining in the claim is intended to be surrendered.

Also, since a dependent claim inherently includes the recitations of the claim or chain of claims from which it depends, it is submitted that the scope and content of any

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dependent claims that have been herein rewritten in independent form is exactly the same as the scope and content of those claims prior to having been rewritten in independent form. That is, although by convention such rewritten claims are labeled herein as having been "amended," it is submitted that only the format, and not the content, of these claims has been changed. This is true whether a dependent claim has been rewritten to expressly include the limitations of those claims on which it formerly depended or whether an independent claim has been rewritten to include the limitations of claims that previously depended from it. Thus, by such rewriting no equivalent of any subject matter of the original dependent claim is intended to be surrendered. If the Examiner is of a different view, he is respectfully requested to so indicate.

Rejection Under 35 U.S.C. 102

Claims 1, 2, 4, 9-11, 14 and 16-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Chou. The rejection is traversed.

Independent claim 1 has been amended by incorporating the features from claim 22, and now recites, in part: "a non-linear optical element for imparting a non-linear effect on the combined signal to generate a number of optical bands based on a simultaneous three-signal interaction of the two optical pump signals and the input data signal."

Independent claim 18 has been amended by incorporating the features from claim 23, and now recites, in part: "imparting a non-linear effect on the combined signal to generate a number of optical bands based on a simultaneous three-signal interaction of the two optical pump signals and the input data signal."

No new matter has been added in these amended claims.

Since there is no argument put forth in the Office Action that claim 22 or claim 23 is anticipated by Chou, Applicants submit that the amended claims 1 and 18 are patentable under 35 U.S.C. 102 over the teaching of Chou.

Claims 16 and 19 have been amended to provide consistency with the amended claims 1 and 18, respectively. Claim 20 has been amended to provide for consistency with claim 19 from which it depends.

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Since all of the dependent claims that depend from the independent claims include all the limitations of the respective independent claim from which they ultimately depend, each such dependent claim is also allowable over Chou.

Therefore, Applicants' claims 1, 2, 4, 9-11, 14 and 16-21 are allowable over Chou under 35 U.S.C. 102. The Examiner is respectfully requested to withdraw the rejection.

Rejection Under 35 U.S.C. 103(a)

Claim 8

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou in view of Farries. The rejection is traversed.

This ground of rejection applies only to a dependent claim, and is predicated on the validity of the rejection under 35 U.S.C. 102 given Chou. Since the rejection under 35 U.S.C. 102 given Chou has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Farries supplies that which is missing from Chou to render the independent claims anticipated, this ground of rejection cannot be maintained.

Therefore, Applicants' claim 8 is allowable over Chou and Farries under 35 U.S.C. 103. The Examiner is respectfully requested to withdraw the rejection.

Claim 15

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou. The rejection is traversed.

This ground of rejection applies only to a dependent claim, and is predicated on the validity of the rejection under 35 U.S.C. 102 given Chou. Since the rejection under 35 U.S.C. 102 given Chou has been overcome, as described hereinabove, this ground of rejection cannot be maintained.

Therefore, Applicants' claim 15 is allowable over Chou under 35 U.S.C. 103. The Examiner is respectfully requested to withdraw the rejection.

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Claims 1, 2, 4, 8, 15, 17-19, 22 and 23

Claims 1, 2, 4, 8, 15, 17-19, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda in view of Bjarklev and further in view of Cearn. The rejection is traversed.

Claims 22-23 have been canceled, and their rejection is therefore moot.

Claims 1 and 18 have been amended, as previously discussed, to incorporate the features of claims 22 and 23, respectively.

Examiner cited Takeda's Fig. 3 and corresponding discussions as allegedly teaching various features in Applicants' claim 1. For example, elements 22, 24, 25 and 27 in Fig. 3 and col. 4, line 31 to col. 5, line 29 of Takeda were cited as allegedly teaching a first combiner for combining an input data signal with two pump signals to produce a combined pump signal, and elements 21 as teaching a non-linear optical element for imparting a non-linear effect on the combined signal (Office Action, page 6).

Applicants submit that the elements in the cited sections of Takeda do not correspond to each of the features of claim 1 as identified by the Examiner.

As stated in the Office Action, although Takeda teaches two pump signals with different wavelengths, Takeda also teaches that only one pump signal is combined with the data signal at a time.

Thus, the combined signal in Takeda, which consists only of one pump and the data signal, is not the same as Applicants' combined signal formed by combining the data signal with at least two pump signals. As such, Takeda's two fiber elements 21, each of which allows wave mixing of Takeda's combined signal of one pump and one data signal, are also not the same as the non-linear optical element of Applicants' invention, which provides for interaction of two pump signals and a data signal.

Acknowledging the deficiencies in Takeda, the Examiner further relied on Bjarklev's paragraph 0002 for disclosing the use of two pump signals together in a four-wave mixer, and Cearn's Fig. 4, col. 5, lines 23-50 for disclosing an optical bandpass filter "that passes the filter wavelengths through and reflects the unfiltered wavelengths" (page 6, Office Action), and thus, concluded that Applicants' claim 1 is obvious over the combined teaching of Takeda, Bjarklev and Cearn.

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Applicants submit that, even if combined, the teaching of Takeda, Bjarklev and Cearns would not have resulted in the amended claim 1 or claim 18.

Specifically, Takeda teaches that each pump signal (λ_{p1} or λ_{p2}) has a wavelength equal to one of the two zero dispersion wavelengths (e.g., $\lambda_{p1}=\lambda_{01}$ and $\lambda_{p2}=\lambda_{02}$) of the two sequentially connected fibers 21-1 and 21-2, and for each pump signal, the phase matching condition is satisfied only in one of the two fibers (Fig. 3, col. 4, line 29 to col. 5, 22). Depending on which pump wavelength is selected, the converted light from one of the two fibers may have a wavelength of λ_{c1} or λ_{c2} . That is, interaction between one pump wavelength and the data signal will occur only in the fiber for which phase matching is satisfied (to generate λ_{c1}), while the other pump wavelength and the data signal will interact only in the other fiber to generate λ_{c2} .

Thus, even if Takeda were combined with Bjarklev so as to provide two pump wavelengths to the fibers, the two pump wavelengths and the data signal would still not be interacting in the same fiber, because, as taught by Takeda, one of the pump wavelengths is still different from one fiber's zero dispersion wavelength, and thus, would not satisfy the phase matching condition in that fiber.

As such, the combined teaching of Takeda and Bjarklev would not have resulted in the feature: "to generate a number of optical bands based on a simultaneous three-signal interaction of the two optical pump signals and the input data signal," as in Applicants' claim 1 or claim 18, because the non-linear effect in each fiber will still involve only one pump signal with the requisite wavelength and the data signal.

Since there is no argument put forth in the Office Action that Cearns teaches the above feature that is missing in Takeda and Bjarklev, claims 1 and 18 are not obvious, and thus, patentable over Takeda in view of Bjarklev and Cearns under 35 U.S.C. 103(a).

Claims 2, 4, 8, 15, 17 and 19 depend, directly or indirectly, from independent claims 1 or 18, respectively, while adding additional elements. Therefore, these dependent claims are also non-obvious and are patentable over Takeda in view of Bjarklev and Cearns under 35 U.S.C. §103 for at least the same reasons discussed above in regards to independent claims 1 and 18.

Applicants submit that claims 1, 2, 4, 8, 15 and 17-19 are allowable under 35 U.S.C. 103. The Examiner is respectfully requested to withdraw the rejection.

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Claim Objections

Claims 3, 5-7, 12 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The objection is traversed.

Claim 3 has been amended to provide for proper antecedent bases relating to the frequencies of the data signal and pump sources. No new matter has been added.

Applicants thank the Examiner for the indication of allowable subject matter with respect to these claims. However, for at least the reasons discussed above, the base claim is allowable under 35 U.S.C. §§102 and 103 and, as such, claims 3, 5-7, 12 and 13 are also allowable in their existing dependent form.

The Examiner is respectfully requested to withdraw the objection.

New Claim

New independent claim 24 has been added. Claim 24 corresponds substantially to the original claim 3, which was deemed to be allowable if rewritten in independent form to incorporate all limitations from the previously presented claim 1. Applicants submit that claim 24 is also allowable over the cited references.

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Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, the Examiner is invited to call Eamon Wall at (732) 530-9404 so that arrangements may be made to discuss and resolve any such issues.

Respectfully submitted,

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